DOCUMENT RESUME

ED 229 270 SE 041 552

AUTHOR Clements, M. A.; Jones, Peter L.
TITLE The Education of Atawe. Indigenous Mathematics Project. Working Paper 16.
INSTITUTION Indigenous Mathematics Project, Port Moresby (Papua New Guinea).
SPONS AGENCY Papua New Guinea, Dept. of Education, Port Moresby.; United Nations Educational, Scientific, and Cultural Organization, Paris (France).
PUB DATE Mar 81
NOTE 42p.; For related documents, see SE 041 540-555.
PUB TYPE Reports - Descriptive (141) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Biographies; Cross Cultural Studies; *Cultural Influences; Educational Research; *Ethnography; *Field Studies; Language Role; Mathematics Curriculum; *Mathematics Education; Mathematics Instruction
IDENTIFIERS *Indigenous Mathematics Project; Mathematics Education Research; *Papua New Guinea

ABSTRACT

This is the story of how one man, Atawe, born in the remote village of Wiyava in the Eastern Highlands of (Papua) New Guinea in the mid-1950's has increasingly immersed himself in a lifestyle which, even just a few years before he was born, was completely unknown to his people. His story is traced as he progressed from a village where the language did not have names for numbers to the position of tutor in mathematics at a university. The culture of the Baruya peoples is first described. Atawe's preschool years are sketched, followed by his education at mission primary, boarding, and high schools: he was one of three children who were the first from the Baruya people ever to begin secondary education. He entered a teacher's college, then transferred to the university. He was appointed a tutor at the University of Technology, which enabled him to continue with higher mathematical studies. The report closes with some reflections on education in Papua New Guinea and elsewhere. Instruction in an unfamiliar language, mathematical concepts without relevance in traditional life, and sophisticated syllabuses are discussed. (MNS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED229270

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

✓ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Randall Souviney

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

INDIGENOUS MATHEMATICS PROJECT

SE041552

THE EDUCATION OF ATAWE

M.A. (Ken) Clements
Peter Jones

Working Paper 16
March 1981

THE INDIGENOUS MATHEMATICS PROJECT

This series of working papers and research reports has been published to provide a comprehensive source of documentation on research and development efforts associated with the Indigenous Mathematics Project. The Project was established in 1977 by the Government of Papua New Guinea to investigate various aspects of traditional mathematics development. During the first phase (1977–79) of the five year program, basic research in crosscultural cognitive development was carried out and indigenous counting, classification and measurement systems used throughout the country were documented. During the second phase of the project (jointly funded by the Department of Education and UNESCO), pilot instructional materials were developed and trialled. The intent was to assess the feasibility of utilizing complementary aspects of indigenous and Western mathematics as a basis for developing culturally relevant student materials, instructional aids and teachers' guides which reflect the practical constraints of the community school environment. The results of IMP work are intended to inform future curriculum development in an effort to provide more appropriate instructional materials and learning aids for Community Schools throughout Papua New Guinea.

Series Editor: Randall Souviney
Managing Editor: Jacquie Wathen

THE EDUCATION OF ATAWE

M.A. (Ken) Clements
Monash University

P.L. Jones
Papua New Guinea University of Technology

This is the story of one man's quest for education. It begins in the modest surroundings of an isolated village in the Papua New Guinea Highlands. We follow young Atawe as he leaves his home to learn the secrets of the outside world, never dreaming that one day he would eventually find himself a tutor of mathematics at the University of Technology. The authors help us to understand the profound contradictions confronting Atawe's generation who are the vanguard of technological leaders in this rapidly developing country. The Education of Atawe is a truly remarkable story, made all the more remarkable by the thousands of similar lives played-out in intensely personal ways by young people in developing countries the world over.

ACKNOWLEDGEMENTS

Randall Souviney, Director of the Indigenous Mathematics Project, for arranging for the Project to contribute towards costs of Atawe and M.A. Clements visiting Wiyava, April 1980; also, for reading and commenting upon the draft version of the paper.

Phil Clarkson, Peter Fensham, Jane Jones, Glen Lean, Anne McDougall, Peter Musgrave and Brian Sherman, for reading and commenting upon the draft version.

Floyd and Lynna Ausburn, for reading and commenting upon the draft version, and for making available photographs of Wiyava village.

Elaine Scott, who produced both the draft and final versions of the paper on the Faculty of Education, Monash University, word processor, and Claude Sironi, who assisted in the development and presentation of photographs and drawings.

Neil Roberts and Lawrence Ros, for providing oral evidence in relation to Atawe's education; David and Florence Tuff, Erhard Pinno, and Rhoda Carlstedt, for their thoughtful written recollections of Atawe's schooling.

Richard and Joy Lloyd, who, for a week in April 1980, provided accommodation, at their home near Wiyava, for the 'research team'; also, for their invaluable background information on Atawe and the Baruya people and their comments on the draft version.

Monash University, for granting Ken Clements overseas study leave during 1980; also Papua New Guinea University of Technology (Lae), for research funds, and the Papua New Guinea Department of Education and the University of Papua New Guinea (at Port Moresby and at Goroka Teachers' College) for access to official records.

The people of Wiyava and Yanyi, and the staff and students of the Wonenara Community School, for the warm welcome they offered their 'visitors' in April 1980.

Most of all, to Atawe and 'Meru', for their co-operation and trust.

Ken Clements
Peter Jones

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	ii
TABLE OF CONTENTS	iii
LIST OF ILLUSTRATIONS	iii
INTRODUCTION	1
THE BARUYA	4
PRE-SCHOOL YEARS	10
AT THE LUTHERAN SCHOOL IN WONENARA, 1964-7	11
THE BOARDING PRIMARY SCHOOL AT ASAROKA, 1967-1970	15
ASAROKA HIGH SCHOOL, 1971-4	18
TERTIARY STUDIES, 1975-9	22
'UNITECH' TUTOR'	27
REFLECTIONS ON EDUCATION IN PAPUA NEW GUINEA AND ELSEWHERE	29
REFERENCES	34

LIST OF ILLUSTRATIONS

Figure	Title	Page
1	Papua New Guinea (showing Port Moresby, Lae, Goroka and Wiyava)	2
2	A Baruya man, in traditional dress, at Wiyava, 1980	3
3	At Wiyava village, 1980	6
4	Two traditional Baruya drawings	8
5	A group of Wonenara Mission School pupils (c.1965)	12
6	The young Atawe (foreground) reading to Mrs Tuff's class, Wonenara Mission School (c.1965)	12
7	Atawe - 'Unitech' tutor, 1980	25

THE EDUCATION OF ATAWE

by M.A. (KEN) CLEMENTS and PETER JONES

Introduction

This is the story of how Atawe, who was born in a remote village in the Eastern Highlands of New Guinea[1] in the mid-1950s, has increasingly immersed himself in a lifestyle and a network of ideas which, even just a few years before he was born, were completely unknown to his people. In one sense it is a remarkable story for it tells how a young boy, whose father and mother had died before he was six, progressed from a village where the language spoken did not have names for numbers to the position of tutor in mathematics at a university: in another sense, however, it is not so remarkable, for in the rapidly developing country of Papua New Guinea there are many stories which broadly resemble the one about to be told. Only the details differ. They all tell of how young men and women, born into a pre-technological society, have attended schools and higher education institutions run along Western lines and have, apparently against all odds, graduated and become leaders in their country's quest for technological advancement. The oft-heard expression 'a thousand years in a lifetime' can, without exaggeration, be applied to each and every one of them.

Before beginning the story a few comments on the sources of information are in order. The main source is four tapes on which Atawe answers questions, posed by the authors, concerning details of his life. With respect to these tapes, it is not surprising that Atawe's memory is sometimes hazy on certain points, especially those pertaining to the early years of his life. Another important source is a set of letters, written to the authors in 1980 by persons Atawe nominated as having had an important influence on his life. A third source is records summarizing Atawe's performance on various psychological and educational tests for which he sat over the past ten years; these records are held by the Papua New Guinea Department of Education, and the University of Papua New Guinea (at Port Moresby and at Goroka Teachers' College). Another source has been information gained from informal talks which the authors had with Atawe and with certain others involved with his education. Finally, in April 1980 one of the authors (Clements) went with Atawe, for a period of one week, to the village where he was born.

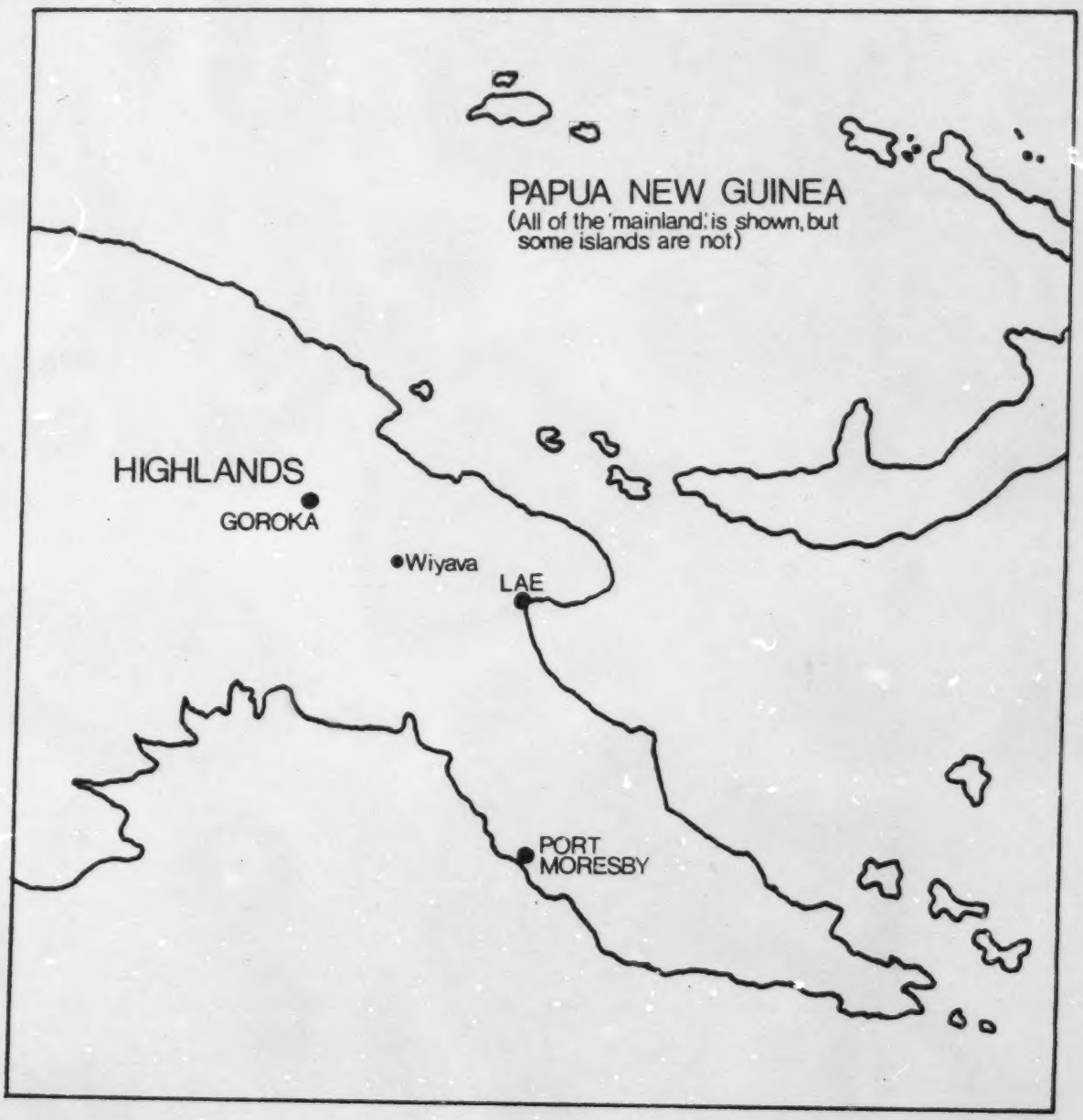

Fig. 1: Papua New Guinea (showing Port Moresby, Lae, Goroka, and Wiyava)

Fig. 2: A Baruya Man, in Traditional Dress, at Wiyava, 1980.
(Photograph by F. Ausburn)

The Baruya

The young nation of Papua New Guinea represents an uneasy alliance of some three million coastal, island and highland peoples, who embrace over 700 languages and, presumably, almost as many indigenous counting systems. Many areas of the country, especially the islands and certain coastal regions, have been subjected to Western influence for over 100 years and their peoples have, to different degrees, adopted non-traditional ways (like, for example, Christianity, and European dress). In many remote areas, however, and particularly certain areas in the highlands, traditional customs and dress remain, though even here tok pisin ('Pidgin') is increasingly spoken. Indeed, tok pisin is rapidly becoming the lingua franca of this emerging nation, despite a decision of the nation's fledgling parliament to make English the sole language of instruction in schools.

Atawe was born in Wiyava, a small village in the south-east of the Eastern Highlands. No white person was seen in the Wiyava district before 1951, and the Australian government did not place the district under colonial administration until 1960. Maurice Godelier, the distinguished French anthropologist who has lived in Wiyava from time to time since 1967, has described the Baruya, a language group which includes those who live within and around Wiyava, as a classless society which has 'only recently closed the neolithic door behind it'.[2] But although, according to Godelier, there are no significant economic inequalities between individuals in Baruya villages, there are well-defined differences in status between certain groups. In particular, Baruya men traditionally dominate within their society, and consider women to be a constant threat to social order and themselves. Furthermore, all men are not equal: warriors and 'shamans' (thought to possess magical powers) hold the most highly prized positions in a society in which tribal warfare and invisible powers are considered to be of paramount importance.[3]

Today, slightly more than 200 people live in Wiyava, which rests quietly on the side of a mountain about five kilometres ('one and a half hours walk') from Wonenara, a small administrative centre in the Eastern Highlands. During the sixties and seventies Europeans have visited the Wonenara district with increasing frequency, such visits being made relatively simple by the development and maintenance, since the early sixties, of a rough airstrip at Wonenara. Easy access inevitably meant that the people of Wiyava have found themselves face to face with strangers who sought, declared, and imposed their 'right' to 'pacify' them, to educate them towards 'civilization', and, most of all, to study them. Anthropologists, linguists, missionaries, educators, and media personnel are among those who have been drawn to work among the Baruya.

Perhaps the most obvious reminder to the Baruya that they are no longer a completely separate people is the special house, standing right in the middle of Wiyava, which Godelier occupies when he comes to the village. Although this house is built from traditional materials it is clearly more elaborate than any other building in Wiyava. About two kilometres from Wiyava, Richard and Joy Lloyd, linguists attached to the Summer Institute of Linguistics, live in a house which, although also built from traditional materials, is clearly more Western in character and facilities than any other dwelling in the district. The Lloyds have lived among the Baruya since 1961 and are widely respected there; they have created an orthography for the Baruya language, conduct daily vernacular language classes and, with the aid of vernacular translations of various books of the Bible, conduct weekly Christian church services. In 1969, and again in 1979, a film team from the Commonwealth Film Unit (now 'Film Australia') came to Wiyava and captured on film those aspects of traditional life which the villages allowed to be filmed; in 1980 a group of researchers from the Papua New Guinea University of Technology, Lae, and Monash University, Melbourne, spent one week in and around Wiyava investigating the spatial and mathematical competencies of village children; in 1979 the first government school in the area was opened at Wonenara, and in 1980 a handful of children from Wiyava attended the school; during the sixties and seventies the government kiap (administrative officer) stationed at Wonenara would often visit Wiyava and, theoretically, had power to enforce government regulations and payment of taxes; by 1980 most, if not all, of the younger people in Wiyava can converse freely in tok pisin as well as in the vernacular, and many villagers, including both adults and children, wear tattered Western clothes. Undoubtedly, non-traditional influences are slowly but surely eroding traditional culture. While the European visitor still has the gadgetry (for example, polaroid cameras) to command interest from villagers, some of Western man's greatest inventions, like the aeroplane, are well known to the villagers. Yet, rumour has it, twenty years ago when an aeroplane first landed in Wonenara villagers timidly approached the 'giant bird' and offered it kau kau (sweet potato); and, while they were near the huge mysterious creature, they peered beneath to see if they could establish its sex.

It should not be imagined, however, that the Baruya are actively discarding all of their traditional world views and practices. Certainly, the distance separating, in time and space, Wiyava from the wider world has been narrowed, but the modes of thought and operation, passed on through countless generations, continue. At the age of nine or ten boys are separated from their mothers and other females and, thereafter, through a cycle of initiations lasting over ten years, are thoroughly acquainted with

Fig.3: At Wiyava village, 1980
(Photograph by F.Ausburn)

the rules of social life and the order of the universe. The boys learn, from tribal elders, that Nature is a twofold reality consisting of visible and invisible forces, and that evil spirits and the souls of the dead influence the course of events within and around the village. Violations of Nature can lead to disasters, such as poor harvests and death. It is necessary to appease the spirits, through certain magic rites performed by worthy persons, in order that desired outcomes, like, for example, plentiful harvests, will occur. Above all, the sun and the moon are endowed with knowledge and will, similar but superior to man. In Baruya language, mythology and ideology, the sun and the moon are the father and mother of mankind and in kinship terminology they are designated by the terms of address applying to father and mother.[4]

During his lengthy period of initiation a Wiyava boy is prepared, by the men of the village, for that time when he will be allowed to take his first wife and participate fully in adult life. An appropriate marriage is usually arranged, with substantial bride price and elaborate wedding celebrations being the rule. After his first marriage a man can choose to have more than one wife if he wishes to do so. According to Baruya belief, physical and personality characteristics are completely derived from the father, the pregnant woman merely providing a garden in which the seed, from the father, germinates. (Such a view, incidentally, was held by male European biologists as late as the mid-eighteenth century.[5]) It is not surprising, then, that the Baruya believe that children who have the same mother, but different fathers, are unrelated, unless, of course, the fathers themselves are descended from the same male.

Boys beginning the process of initiation are given new names and are required to live together in a special boys' hut. This is a large circular construction made of traditional materials; it is geographically isolated from the rest of the village. Under no circumstances should an occupant of the boys' hut attempt to communicate with, or be physically near, a girl or woman. The septum of a young initiate's nose is pierced and a bone is inserted as a sign of manliness.

The Baruya language is the vernacular first learnt by all inhabitants of Wiyava. This language, which is largely confined to the Wonenara-Marawaka districts of the Eastern Highlands, has approximately 6000 speakers.[6] The structure of the language is complex but, according to linguists Richard and Joy Lloyd, most English sentences and ideas can be readily translated into the vernacular, and vice versa. There are exceptions both ways however: for example, there are no standard units of length,

area, volume, time and temperature in the vernacular, so statements in English concerned with measurement of these quantities cannot be translated to fairly equivalent vernacular statements; similarly, the vernacular contains fine distinctions in relationships between people, and these cannot be expressed easily in English.

Traditionally, the Baruya have drawn only two basic pictures:

A Possum
drawn by a 14 year-old boy,
at Wiyavi, 1980.

Plan of a taro garden
drawn by the same
boy as drew the
possum

Fig. 4: The Two Traditional Baruya Drawings

a possum, and the plan of a taro garden. When these pictures are drawn, which is not often, they are usually scratched on the ground with a stick. Of course, it is only in recent years that the Baruya have become aware of the existence of pencils, books, and photographs. Even at the beginning of the 1980s most residents of Wiyava had never held a pencil.

Before the 1980s the Baruya had few good reasons to believe that the shadowy world beyond the surrounding mountains and deep ravines had much to offer them. Certainly, they were thankful that 'outsiders' regularly visited Baruya villages and were pleased to exchange certain desirable commodities for the 'white and heavy' bars of salt which Baruya men, possessing technical and magical know-how, were able to produce in abundance. Thus the Baruya knew that they could secure everything which they needed, even those things which they themselves could not produce. In exchange for salt the 'outsiders' brought stone axes, and later steel axes and knives, which were necessary for subsistence; they also brought bark cloaks, which provided protection from the cold, and feathers, shells, and pearls, which were used for adornment and finery. Salt bars were even acceptable as payments for tribal debts (for example, compensation for murder). Salt was precious, therefore, because it allowed the Baruya to overcome the limits of their resources, the limits imposed by their ecology and economy.[7]

Another precious commodity among the Baruya is the pig which, like salt, is good to eat yet scarce. In Wiyava one can sometimes see a mother suckling an infant to one of her breasts and a small pig to the other. Pigs born within a village are typically treated as pets, but wild pigs and possums, which can be found in the mountains, are hunted by village men. Meat is scarce, and villagers mostly eat vegetables, especially taro and kau kau, cultivated in their own gardens. To the European, conscious of the need for a balanced diet, the Baruya rarely get enough protein; the bulging stomachs of many young children testify to this. Tinned meat is sold at the trade store which is operated by the Wiyava people, but it is rarely bought, for although Papua New Guinean money is circulated among the Baruya, the idea of a cash economy is regarded with suspicion.

It was in Wiyava, in the mid-1950s, that Atawe was born. There are no birth records so one cannot be certain of his age, but Atawe believes he was about four years of age in 1961, when Richard Lloyd, the linguist, first settled in the district. Richard Lloyd believes, however, that in 1961 Atawe was about seven or eight years old (but 'very small and thin'). According to Atawe, Richard Lloyd's coming prompted much speculation among villagers, the most widely circulated story being that this white-skinned man was a spirit of an ancestor.

Pre-school Years

Atawe's mother was his father's third wife. At the time of their marriage his mother, a widow, had three children (two girls and a boy) and his father two children (a girl and a boy). Atawe remembers his mother and father fighting a lot, and when he was about four years old his mother decided to leave her husband, at Wiyava, and go with her children to another Baruya village, Wanyir, on the side of a nearby mountain, where she was looked after by her brothers. The separation must have been fairly amicable, for Atawe recalls that now and then his father would collect him and take him to Wiyava for a feast, after which he would be taken back to his mother. Atawe lived with his mother and her brothers for only a year or two before his mother died. His father then took him back to Wiyava. A couple of years later Atawe's father also died and Atawe was then brought up by his father's brothers and his grandmother in Wiyava. Atawe does not know how his parents died: he simply remembers that they both became very ill. The main source of medical advice and attention at the time was the village 'shaman'. European medical treatment, and hospital facilities, were, of course, unknown to villagers. They were not aware of the relationship between dirt and disease and this, together with the prevalence of malaria (and, no doubt, other tropical diseases) and deaths arising from tribal fighting, meant that life expectancy among the Baruya was low. Even today in the 1980s only a tiny proportion of the Baruya people have reached fifty years of age.

During his early years in Wiyava and in his mother's village, Atawe wore traditional reed clothing supplemented by a bark cloak which served to keep out the cold. Every day the young Atawe played with other young boys. These boys shared a common culture. They spoke only the Baruya language and on most days played hide and seek or practised using the small bows and arrows which they had made.[8] Occasionally they swam in the stream at the bases of the mountains. They would rise with the sun, eat some taro or kau kau, and then spend the daylight hours together; in the evening they would have some more taro or kau kau before going to sleep on the palm floors of their traditional huts. Sometimes they were hungry and cold; sometimes they were not well. Atawe recalls the time when he was so sick that his father thought he was dying. His father killed a pig to bring some warmth and happiness to his dying son. But Atawe lived.

Of course, Atawe and his young friends knew nothing of wrist watches, manufactured toys, radios, bicycles, cars, washing machines, guns, atomic bombs and other such goods common in technological societies. Father Christmas, the welfare state, electricity, hospitals, and formal education were not familiar

concepts for the Baruya. The young boys living in Wiyava were curious therefore, when one day in 1964 Atawe's uncle gathered them together and told them that he would like them to go each day to learn 'important things' at a 'white man's school' which had just been built in Wonenara. Atawe and his friends realized that this meant that they would have to walk from Wiyava to Wonenara and back each school day, but they did not mind, for they were excited at the prospect of doing something which was different from anything they or anyone else from Wiyava had done before.

At the Lutheran School in Wonenara, 1964-7

In a recent letter to one of the authors (Clements) the Rev. David and Mrs Florence Tuff, now living in Oshkosh, Wisconsin, wrote that they first moved into Wonenara in May 1964 on behalf of the Lutheran Mission. They took with them a Mr Rudolph, who was from Tapen in the Madang Province and was qualified to teach English, and a carpenter named Ziling. After an initial period when bush houses and a school building were constructed, the Wonenara Lutheran Mission School was ready to open. The Rev. and Mrs Tuff recall:

> The people from the first were inquisitive and eager to learn why we were coming to live among them ... When the call went out for students for the school the parents brought their children in great numbers - some very small, some much older. The traditional way of estimating age was to have the candidate place one arm over the head to see if it would reach the opposite ear. If it did not, it was considered that the candidate was too young. The older boys eventually went into the Pidgin Bible School, the younger ones went into Mr Rudolph's Prep. class, and the slightly older ones into the Standard I class that Mrs Tuff started. Her first class had 12 boys plus two Aid Post operators (doctor boys), from the station at Wonenara, who also wanted to learn English ... We used the Australian curriculum - strong emphasis on English, Math and Social Studies.

Atawe remembers going to the school on the first day it was opened, and the Tuffs estimated his age at eight or nine years. According to the Tuffs, the school was occasionally visited by the Lutheran Mission Primary school inspector, and New Guinea Administration inspectors, and these inspectors 'were always impressed with the enthusiasm of these children who for the first time were experiencing any outside influence on their lives'.

Fig. 5: A Group of Wonenara Mission School Pupils (C.1965)

Fig. 6: The Young Atawe, (foreground) Reading to Mrs Tuff's Class, Wonenara Mission School (C.1965)

Certainly, the children were introduced to a new world. For the first time they held books in their hands and looked at pictures and drawings. Friends of the Tuffs, in America, sent many books ranging from a Golder Book series to National Geographic magazines. The Tuffs were also sent Viewmasters and a supply of slides and these were very popular with the children and their parents. The children were expected to work in the school gardens each day as well as attend the normal lessons.

In 1964 Atawe was in the kindergarten class. Although Mr Rudolph, the teacher, could speak English, in the classroom he usually spoke 'Pidgin', and a local teenage boy who had acquired some 'Pidgin' while working for a kiap (local government administrator), translated what Mr Rudolph said into Baruya. Atawe recalls that for the first few weeks at school he greatly amused himself by making drawings on a slate. According to Atawe, there were fifty or sixty boys in his class, but no girls. Baruya girls were not permitted to attend the school. The subjects of instruction were Devotions, Arithmetic and Social Studies. Altogether, about twenty boys from Wiyava attended the school at first; most of them were in the kindergarten class, some were in Mrs Tuff's first grade class, and a few older boys attended a 'Pidgin Bible School'.

Atawe cannot remember what he was taught in his kindergarten year. He does recall, however, that school represented an exciting, different experience for him and his classmates, and that they enjoyed the opportunity of being together. During this first year no fee for instruction was requested, but later an annual fee of fifteen cents was required. Atawe's grandmother paid for him - apparently she got this money by selling kau kau to the kiap in Wonenara. But the days were long for Atawe. He had to rise before dawn, and sometimes the torrential rains made it almost impossible for him to walk to and from school. Also, while other boys' mothers would cook them kau kau for their breakfast and lunch, no-one did this for Atawe. Usually his only meal came when he got home from school, although occasionally a friend at school would share some kau kau with him. 'I was always hungry', he recalls, 'and was easily the thinnest boy in my grade'. An early photograph (provided by Mrs Tuff) of boys at the school confirms this. The Mission provided most of the boys, though not all of them, with one or two articles of Western clothing - usually a cotton T-shirt and/or cotton shorts. In the early photograph Atawe is wearing a T-shirt and a wrap-around lap-lap.

At the end of 1964 Mr Rudolph adopted an interesting method of deciding which of his pupils should be eligible for promotion to first grade in 1965: he asked each boy, individually, to count from one to ten in English. Atawe, who had learnt to count in English from Yankao, a Lutheran missionary who had recently moved into Yanyi,

a village near Wiyava, passed the test. Another boy, who subsequently became the only other boy from Wiyava to proceed to both secondary and tertiary studies, failed. He repeated the kindergarten year in 1965. In 1980 he was doing the third year of a degree in the Forestry Department at the University of Technology.

In 1965, then, Atawe was in first grade and his teacher was Mrs Tuff. Mrs Tuff always spoke English and, since there was no-one at the school capable of translating what she said into Baruya, the children were faced with the daunting task of trying to make sense of instruction given in a language they did not understand. 'Day after day she spoke English', Atawe recalls. 'Sometimes she spoke 'Pidgin', but rarely. Later on ... we began to pick up what she meant. It's fascinating. I look back, these days, and I remember that this lady was always speaking English and we had little or no knowledge of English words and expressions. But we never complained, because it was so fascinating, going to school, holding pencils, doing drawings on paper, and so on'.

It is easy for an 'outsider' to be critical of the instruction provided at this mission school. But the Tuffs were providing a service which no-one else was prepared to do. The photographs provided by the Rev. and Mrs Tuff show Mrs Tuff as a young woman with blonde hair and a determined, but happy, face. Undoubtedly, her task in the Wonenara school was an unenviable one. She knew that the children could not understand most of what she said to them. But the alternative was to do nothing. While some may think this may have been preferable, Atawe, who was there, does not. In retrospect it is clear that the Tuffs provided the opportunity of his lifetime. During grade 1 Mrs Tuff, with the aid of flash cards, gradually began making progress in teaching some of her class to speak and read English. As Atawe says, 'We began to pick up what she was meaning'. The grade 1 class was taught arithmetic. Mrs Tuff required the boys to bring sticks and stones to school to assist the teaching of number concepts and operations. According to Atawe, the Department of Education provided the school with rulers and exercise books for the boys.

In 1966 Atawe graduated to grade 2, which was taken by Mrs Tuff. Of the boys attending the school only five were from Wiyava and of these five only two, Atawe and one other, were in grade 2. As Mrs Tuff remembers it, Atawe was a very good student, who 'was good at Math'. In one of the photographs which Mrs Tuff sent to the writers the young Atawe is shown, book in hand, teaching the class. But early in 1967 the Tuffs found themselves with a difficult decision to make. They were due to take a year's furlough and while a replacement could be found who could cope with boys from kindergarten to grade 2, it was not possible for a grade 3 class to be taught at Wonenara in 1967. What was to become of Atawe and the other eleven boys who had been in grade 2 in 1966?

In their letter to the authors the Tuffs state, simply, that 'Atawe's class moved to the primary school at Asaroka Lutheran Mission, southwest of Goroka'. Atawe has provided more details of how the crisis was overcome, however. Apparently the Tuffs encouraged the villagers responsible for the grade 2 children to allow them to go to Asaroka. The Lutheran Mission agreed to meet the costs of transporting the children the fifty odd miles from Wonenara to Asaroka provided the villagers would provide the boys with blankets and spades. Although the people of Wiyava were concerned that two boys would leave the village before they were initiated, they nevertheless found the necessary money for the blankets and spades. There were no roads out of Wonenara and so, in April 1967, Atawe and the other boy had their first aeroplane flight - in a Mission 'plane from Wonenara to Goroka. From Goroka the boys were driven in a car to the boarding school at Asaroka.

The Mission School at Wonenara remained open until 1968, but in that year a decision was made to close the Wonenara air-strip and to establish a new air-strip at Marawaka, eight hours' walk from Wiyava. Local government administration was, accordingly, transferred from Wonenara to Marawaka and the Lutheran Mission, faced with the problem of not being able to receive regular supplies and mail, if it remained at Wonenara, decided to relocate the school at Marawaka. Naturally, Wiyava boys were not able to walk daily from Wiyava to Marawaka. Thus it came about in 1968 that children in the Wonenara district were no longer able to gain a 'formal' education, and this state of affairs continued until 1979, when the Papua New Guinea Department of Education opened a Community School in Wonenara at which both boys and girls were welcome, . In 1980 this school had 100 pupils and two teachers (see Clements and Lean, 1980).

The Boarding Primary School At Asaroka, 1967-1970

On arriving at the Asaroka school Atawe found himself in grade 3 with a National[9] teacher who insisted on English being the sole language of instruction. Atawe speaks bitterly of an experience he had on his second day at the school. The following is a transcript of his description of the incident:

> Each morning one of the children had to tell the class, in English, what he had done the previous day. My turn came the second day I was at the school, but he [the teacher] didn't know that I couldn't speak English; that I couldn't even speak or understand 'Pidgin' very well. I simply couldn't say anything. I just stood there, I was sweating. The teacher just stood there waiting for me to say something. I just told him I couldn't; but he never gave me a chance, he just kept on waiting for me to say something. Eventually he forced me to say something in 'Pidgin'. But my 'Pidgin' wasn't very good. I tried to tell him how I had come on the aeroplane the day before. but he didn't understand me. I never forgave him for that.

According to Atawe that was the worst experience he ever had at Asaroka. It is sometimes difficult for teachers to imagine the extent of difficulties experienced by pupils, and this would appear to be especially true with respect to Papuan New Guinean children learning English.[10]

The Lutheran Mission did not require fees to be paid by any of the twelve Wiyava boys who arrived in April 1968, but the boys were expected to establish their own gardens and then to grow their own food. During the first six months the boys were given rations of rice and tinned fish by the Lutheran Church, but after that they were expected to live from their gardens. Atawe says that he was 'quite small' at this time, and his spade was so big he found it difficult to lift it when trying to dig his garden. He often went hungry because he found it difficult to grow enough; he looked forward to the Christmas vacation when he could return to Wiyava, where he got more food to eat.

According to Atawe, of the twelve boys who went to Asaroka from Wonenara in 1967 only Atawe and two others succeeded in subsequently passing the grade 6 examinations and proceeding to high school. In 1968 a few other Wonenara pupils transferred to a school at Ponampa (near Kainantu), and of these only two subsequently passed the grade 6 examinations. (The student who was studying third-year Forestry at the University of Technology in 1980 was one of these. Like Atawe, he is from Wiyava.) Atawe believes that adults in Wiyava did not understand what happened at school; they believed, though, that children who went there were likely to gain local administrative positions, like assisting the kiap.

Not every Wiyava adult approved of children going to 'White-man's school', and Atawe recalls instances when parents and village elders stopped children who wanted to go to school from going. Some village elders feared that the teaching in the school would steadily erode their beliefs and traditions; in particular, traditional teachings associated with initiation rites might be undermined. But no pressure was put on Atawe to leave school and, indeed, it is interesting that although his parents were dead the people of Wiyava were prepared to contribute to buying the blankets and spade which he needed if he were to go to Asaroka. During the Christmas vacation in 1967 Atawe returned to Wiyava and participated in traditional initiation ceremonies. In the village he was now called 'Kowiliah', but at school he was still called 'Atawe'.

Gradually at Asaroka Atawe became more fluent in reading and writing English. By grade 4 he was coping well with English. Maybe it was his new-found ability to understand what the teacher was saying which enabled him to lift his overall performance considerably in grades 4 to 6. According to Atawe in grade 4 he suddenly began to do well in arithmetic, which mostly consisted of calculations involving the four operations, and in grades 4 to 6 he vied with another boy for first place in arithmetic test results. At the same time, however, academic and temporal demands often conflicted. There was always the need to get enough food, and the kau kau which Atawe grew in his garden was not sufficient to satisfy his needs. On most weekends he would earn thirty cents by working in the garden of a Lutheran missionary; occasionally, people from his village would send food or money to him.

It was in grades 4 to 6 that Atawe became determined that he would continue going to school for as long as he could. He resolved to become a primary teacher. In grade 5 he became aware that at the end of grade 6 he would have to sit for a competitive examination and that his results on this would determine whether he could go on to high school. Atawe recalls:

> I looked forward to the test. As the time came for the test to be held we were so scared. We knew that the future of our education depended on our passing this test. Every day I got more and more scared of failing.

In November 1970 Atawe sat for the all-important tests in Oral English, Written Composition, General Science and Mathematics. When the examinations were over he was free to return to his village, but he decided to remain at Asaroka to await his results. He worked for a missionary for over a month, reasoning that if he did pass he would need money to pay high school fees.

Finally, the results came, and Atawe was one of seven sixth-grade pupils at Asaroka, out of twenty-six who sat, who passed. Atawe was delighted: 'I couldn't believe it. I was so overjoyed. I had never been so happy in all my life'. But now came the problem of paying the $22 per annum fees set by Asaroka High School. Although the headmaster of the High School at that time, Mr Erhard Pinno, states in a recent letter to the authors that the school would have found a way for him to attend even if he could not have raised the money (by providing him with a 'work-scholarship', or a scholarship provided by an individual or a group), Atawe apparently did not realize this. During January 1971 he worked for a missionary and saved $12; somehow, his half-brother back in Wiyava was able to send him another $10. Thus Atawe entered high school. Two other former Wonenara pupils did likewise, and these three were the first children from the Baruya people ever to begin a secondary education. 23

Although Atawe didn't realize it fully at the time, he was gradually growing away from his people at Wiyava. He appreciated their generous support but was told by the teachers at Asaroka that many of the traditional practices in his village were wrong. For example, Atawe, whose father had had three wives, was told that a man should have one wife only. Further, he 'learned' that many tribal secrets and legends passed on to boys at the time of initiation were myths. Atawe dared not tell his people back in Wiyava of the turmoil in his mind - he knew that in his village acceptance of, and adherence to, traditional rites and beliefs was of paramount importance. At the Wonenara and Asaroka schools he had learned the relationship between dirt and disease, but he did not attempt to 'enlighten' his elders. When he returned to his village he became a villager. Atawe's explanation of why he did this is revealing:

> I couldn't go home and tell my poor old grandmother that her food was dirty. I am one of them. The main difference between my grandmother and me was that I'd been to school and she hadn't. Even today I behave like a villager when I'm in the village. They always wanted to know what I was going to become - a kiap or a policeman, or what? I told them I wanted to become a primary school teacher. My brother couldn't stand that; he wanted me to become a kiap.

In 1971, when Atawe began high school, his ambition was to complete grade 10, become a primary school teacher, 'and start earning some money'. He had become used to the strong discipline exerted within the Lutheran boarding school, and was challenged by the Christian teaching which he received in the school. Provided he could continue to pass his examinations there was no reason why he should not realize his ambition.

Asaroka High School, 1971-4

Atawe thinks that it was during his first or second year in high school that he first began to think in English. No longer did he find it necessary to translate in his mind from the English his teachers spoke to his tok ples, Baruya. Undoubtedly this would have assisted his academic development in high school. Another pleasing aspect was the fact that he no longer had to grow his own food. He was now entitled to eat with all the other boarders in the boarding house. Atawe believes that these improved circumstances, together with good teaching from qualified teachers, enabled him to do well in his high school years. His favourite subjects were mathematics, science, and English. Despite his liking for mathematics he found geometry difficult, although in arithmetic, algebra and trigonometry, where the emphasis was on standard operations, he did well. He gained a good grounding in mathematics from good teachers. One of his mathematics teachers is now a high school headmaster and another is a teachers' college lecturer. Miss Rhoda Carlstedt, who taught Atawe during these years, states in a letter to the authors:

> Atawe is certainly a very intelligent fellow, and was at the top of his class in nearly every subject, or very near the top, with Ds [distinctions] or Cs [credits] in everything. In maths he wasn't quite the top, but near enough to have got Ds every year except his first year here, when he got a C - but the highest possible C.

Miss Carlstedt placed Atawe in charge of a trade store managed by the commercial class, an action which surely indicated his numerical competence and trustworthiness.

Miss Carlstedt says she was concerned for Atawe's spiritual and personal development. She writes:

> Atawe and I became good friends. He was rather temperamental, and found it hard to take advice - no matter how tactfully given he always viewed it as insulting. However, I think ... that he had largely overcome this by the time he left here. In spite of this I thought Atawe was a fine boy, with a lot of depth to him. He was respectful, thoughtful, helpful, responsible, conscientious, a hard worker.

She adds, in another part of her letter that although Atawe was well-liked by the other students, he was rather a loner. 'I can't remember him having close friends outside of the boys from his area, and it seems to me he wasn't with them a lot'. In 1980 Miss Carlstedt was still teaching at Asaroka High School.

Further light on Atawe's character development during his high school years comes from comments in a letter by Mr Pinno, the headmaster, who writes that 'Atawe definitely had leadership qualities and was the acknowledged leader of the Marawakas, but he was never elected to be student president'. According to Mr Pinno this could have been because he held rigidly to his views and was not prepared to compromise. On one occasion a fellow student made an insulting remark about him and his people and Atawe could not contain his anger. He had to be restrained from attacking the other person. It is possible, too, that some students regarded Atawe as being 'on the side of the staff' too much. He was dining hall prefect for two years.

Atawe seemed to appreciate the friendship of those who taught him, or had taught him. In 1968 Mr and Mrs Tuff, who had left Wonenara in 1967 for a year's furlough, returned to New Guinea and were stationed at Bena Bena, to the north-east of Goroka. Atawe often visited them there and when he did he would work in their garden. He continued to visit the Tuffs after they moved to Goroka in 1970.

During his high school years Atawe would regularly visit the Tuffs on weekends. He would work in their garden and yard, and became very friendly with the Tuff's youngest son, Nathan. He also confided in the Tuffs of his fears that he wouldn't be able to marry a Baruya girl because, due to his having had to live away from his people for so long, he had not been able to participate fully in the traditional initiation rites. The Tuffs write that they 'felt badly' about that and 'wondered if we had done all we could have to help bridge the transition between their local culture and the larger community of PNG and the European influences there'.

There can be little doubt that during his high school years Atawe fully committed himself to the Christian faith. On Sundays he went out into the villages around Asaroka to teach Sunday School classes. After the occasion when he had to be restrained from striking the student who insulted him and his people, he had a long talk with the school chaplain and the headmaster. According to the Tuffs, Atawe 'talked the whole matter out in a most reasonable way, resolved his anger with everyone involved, and went back to classes a much wiser person ... He was a real model for the school, not only academically, but also as a person and as a deeply committed Christian'.

In retrospect it is clear that Atawe's ambitions and world view were greatly affected by his schooling at Asaroka, and especially by his teachers. There were particularly significant events, however, which are worth relating. The first occurred towards the end of 1972 when Atawe had worked during school vacations to raise money in order that he might pay his school fees of just over $20 per annum. Actually, this amount was substantially below the $50 per annum which was the standard fee for Asaroka High School students, but the school authorities, recognizing that their small group of Baruya students could not possibly raise the standard fee, had fixed a special amount for disadvantaged pupils. Towards the end of 1972, however, the school authorities decided that all pupils going on to grades 9 and 10 would have to pay the full fee. Atawe knew that no matter how hard he tried he would not be able to raise $50 and, very reluctantly, he approached his headmaster, Mr Pinno, to inform him that he would have to leave school. Mr Pinno told Atawe that the School would not allow this to happen, and advised him that arrangements would be made to allow him to continue his schooling. Thus, Atawe returned to Asaroka in 1973 and was overjoyed to find that Mr Pinno had arranged for a Rotary Club in Tasmania to pay his fees. Mrs Pinno writes:

He was provided with a Rotary scholarship given by Rotarians in Australia. If he would not have had this scholarship he still could have managed. His people would have found a co-operative way to send him. And, if that had failed, Asaroka Lutheran High School provided aid in the form of work scholarships. No student was deprived of coming to the school at Asaroka because he/she did not have the necessary funds. In addition to the work scholarships previously mentioned, there were also scholarships provided by individuals or groups. As headmaster, my husband could share some interesting incidents with you about the matter of students allegedly not having enough money for tuition fees.

Nevertheless, it is true that only two boys from Wiyava, Atawe and the student who completed a Fisheries degree in 1980, have ever obtained a secondary education - and both of these went to Asaroka High School.

The second significant event occurred in 1974, when Atawe was preparing for the all-important tenth-year 'external' government examinations. A careers adviser came to the school, administered a series of tests to the tenth-grade students, and then advised them on the careers they might enter. By this stage Atawe was not sure if, in 1975, he should begin a university degree course at Port Moresby or a secondary teacher-training course at Goroka Teachers' College. The careers adviser told Atawe the latter course would be more suitable for him. This advice is understandable in view of the fact that for a long time Atawe had shown interest in being a teacher, and during his high school years he had voluntarily served as a Sunday School teacher.

But, almost certainly, there was another reason why the careers adviser thought it wise for Atawe not to proceed to a university - his results on the tests which he administered did not suggest he was likely to succeed in a rigorous academic environment. Records held by the Psychological Services Division of Papua New Guinea show that the tests indicated Atawe was very strong numerically, strong in clerical matters and in social studies, average in art and science, and weak in practical skills and reasoning. Atawe scored two standard deviations above the grade 10 New Guinea mean on the numerical test, but three standard deviations below the mean on a reasoning test. Atawe recalls that he felt rushed when doing the tests (strict time limits were imposed), and that he had never before experienced such pressure in an examination situation.

Atawe accepted the advice of the careers officer and applied for entry to Goroka Teachers' College. Late in 1974, however, he sat for the external examinations for grade 10 students, and on this occasion he thought he did very well, so well in fact that he began to think that in 1975 he should go to a university, not Goroka Teachers' College.[11] He wrote to the careers adviser saying he'd changed his mind and wanted to begin a university course, but it was too late. As it happened, Atawe performed brilliantly at the external examinations, obtaining straight As; even so, in 1975 he entered Goroka Teachers' College not the University of Papua New Guinea at Port Moresby.

The confusion over his academic future was not often foremost in Atawe's mind during the 1974-5 Christmas vacation period, however, for during this time Atawe spent six weeks in Tasmania, as the guest of the Rotary club which had sponsored him during 1973 and 1974. Atawe was billeted in Rotarians' houses, and the Pinnos recall that he was especially impressed with the amount of work which Tasmanian farmers had to do. Not surprisingly, the trappings of modern technological society also impressed Atawe.

Atawe's visit to Tasmania was symbolic, perhaps of the transition which had occurred in his mind. While he was still proud of his people he was growing apart from them. He now ate Western food, dressed in Western clothes, spoke English fluently, and was a Christian. He had also learnt many of the ways of the Western world through his ten years of education and his visit to Tasmania, and he wanted to teach in schools which, by-and-large, adopted a Western curriculum. At Asaroka High School he used the name 'Atawe' rather than 'Kowiliah', the name which he had been given at his initiation. In Wiyava he was now known only as 'Kowiliah'.

It will be recalled that two other Baruya boys proceeded to high school with Atawe in 1971. Both of these ultimately passed the grade 10 examinations. One of them then attended the Administrative College in Port Moresby, and is now a kiap; the other attended Undal Agricultural College, and is now an Agricultural Officer.

Tertiary Studies, 1975-79

In one sense the move to Goroka Teachers' College in 1975 was not a big one for Atawe, for Asaroka High School was situated quite close to Goroka; also, the dress, food, and customs of the Highlands people of Goroka would have been familiar to Atawe. Thus, although Atawe would have preferred to go to the University of Papua New Guinea in Port Moresby, the Teachers' College at Goroka provided him with

the chance to begin his tertiary studies in a relatively non-threatening environment. Financially, too, he was better off than ever before for, like all other first-year students at Goroka, he possessed a National Scholarship which not only provided him with free food and accommodation, but also free instruction, a book allowance, and a small fortnightly monetary allowance. For the first time since he left the Wonenara school Atawe could feel that he was no different from any of his fellow students; special financial provisions were not being made for him. Like everyone else at the College he would be trained to become a secondary teacher.

One of Atawe's mathematics lecturers at Goroka was Brother Lawrence Ros, a native of Holland and a member of a Roman Catholic teaching order. Brother Lawrence, who has had extensive teaching experience in Africa, has told the writers that he quickly identified Atawe as a very capable student. Records held by Brother Lawrence indicate that Atawe gained a mark of 92 per cent for mathematics, the next highest mark of any of the other 148 first-year students being 86 per cent; seventy-eight of the students scored less than 50 per cent.

As fortune, or fate, would have it, some of Atawe's mathematics classes at Goroka were taken by Dr Lance Bode, who was on temporary leave from his position in the Mathematics Department at the University of Papua New Guinea (UPNG), Port Moresby. Dr Bode noticed that Atawe stood out mathematically from the other students and asked him why he had not gone to study mathematics at the University in Port Moresby. Atawe explained to him the circumstances which had resulted in him entering the Teachers' College despite his desire to go to UPNG, and Dr Bode said that if Atawe still wanted to go to the University in 1976 he would see whether he could do anything about it. Brother Lawrence was not altogether in favour of Atawe going to the University, but Atawe was determined to do so. He applied for permission to begin a degree at the University in Port Moresby in 1976, and was granted provisional admission to the first-year of the Bachelor of Education course. He was not required to do the preliminary year required of students entering UPNG directly from the tenth grade at high school.

Although UPNG had accepted Atawe's year at Goroka as a satisfactory replacement for the preliminary year, in 1976 Atawe quickly realized that standards at the University were much higher than they had been at the Teachers' College. During his first year in Port Moresby Atawe studied Mathematics, Physics, Chemistry, Biology and Science English, and he recalls that at the beginning of the year he found himself well behind other first-year students in all subjects other than Mathematics. Atawe

worked long hours in the evenings to 'catch up', and his diligence was rewarded when, at the first semester examinations, he gained As in Mathematics and Physics, Bs in Chemistry and Biology, and a P in Science English (P or N being the only possibilities for this subject). For the second semester examinations, at the end of 1976, he gained an A in Physics, Bs in Calculus, Chemistry, and Biology, and a P in Science English. Clearly, Atawe's confidence in his own ability to do a degree course had not been ill-founded.

At the beginning of 1977 Atawe applied to change from the Bachelor of Education course to a Bachelor of Science course. Atawe explains that throughout 1976 Dr Lance Bode and Dr Neil Roberts (a senior lecturer in Mathematics) had encouraged him and, although he performed slightly better in Physics than in Mathematics, by the end of 1976 he had decided that he wanted to concentrate as much as possible on mathematical studies; Bachelor of Science students were permitted to take more mathematical subjects as part of their degree course than Bachelor of Education students. However, the transfer of Atawe's National Scholarship from Goroka Teachers' College to UPNG at the beginning of 1976 had been approved subject to the proviso that Atawe must remain a Bachelor of Education student. The Government's Scholarship Branch would not permit Atawe to transfer to a Science degree.

In 1977, his second year at the University, Atawe took four units of Mathematics and one each of Chemistry, Geology, Psychological Development, Basic Studies in Education, and Man and His Environment. His only A was in Mathematics, and his performance in the three 'education' subjects was mediocre, reflecting his lack of enthusiasm for these subjects. In the first semester of 1978 three of the four units which he took were mathematical, but in the second semester he had to concentrate on educational subjects. Atawe believes that his interests and aptitudes were not suited to the educational subjects and, although he did not fail any, his Ds for the teaching methods units, 'Theory and Practice of Teaching Science' and 'Theory and Practice of Teaching Mathematics', tend to confirm this view. Mr Michael Siford, the lecturer who took Atawe for 'Theory and Practice of Teaching Mathematics', told the writers that Atawe's teaching lacked initiative, and he found it difficult to depart from very formal, teacher-centred methods when teaching a class. Be that as it may, Atawe completed his B.Ed. degree at the end of the first semester in 1979. During the second semester of 1978 and the first semester of 1979 he had been permitted to enrol for the more advanced mathematical units which Bachelor of Science students were able to take.

Fig. 7: Atawe - 'Unitech' Tutor, 1980

It is interesting that in 1976 when Atawe transferred from Goroka Teachers' College to UPNG he was convinced that he would become a secondary mathematics teacher; yet, in 1978 and 1979 he did not display much enthusiasm for the 'Theory and Practice of Teaching mathematics' units which he took as part of his course for the Bachelor of Education degree. In retrospect, Atawe believes that this should be interpreted not so much as an indication of a lack of interest in mathematics education on his part, but rather as an indication of his frustration at being refused permission to transfer to a Bachelor of Science course and thus be able to pursue mathematical studies in greater depth.

When Atawe had completed his B.Ed. degree he spoke to Dr Neil Roberts about the possibility of doing further mathematical studies. He could have obtained a Bachelor of Science degree with one additional year's work, but there was no way he could obtain financial support to do the year. When interviewed by one of the present writers (Jones), Dr Roberts stated that he regarded Atawe as the most diligent student ever to have studied mathematics at UPNG, and he therefore encouraged Atawe to apply for a lecturing position in mathematics at Goroka Teachers' College (which, in 1976 had become affiliated with UPNG). However, before Atawe applied for the Goroka position, Dr Roberts spoke with Dr Ian Grant, chairman of the Mathematics Department at UPNG and, after discussion, they decided that Atawe might be especially suited to the more practically-oriented post-graduate course in mathematics which was expected to begin in 1980 at the other university in Papua New Guinea, the University of Technology ('Unitech') in Lae. Dr Grant telephoned Dr Peter Jones, head of the Mathematics Department at Unitech and, after discussion, Dr Jones indicated that Atawe could serve as a tutor in his Department while taking the units for the proposed post-graduate Diploma in Mathematics. On being informed of this possibility Atawe immediately wrote a letter applying for a tutorship in mathematics at Unitech. His application was accepted, and thereupon Atawe moved to Lae, and began serving as a tutor in August 1979.

While at UPNG Atawe did not confine his energies to academic studies. He became superintendent of a Sunday School and a leader in Church youth work; he developed a close friendship with the University Chaplain. In 1978 he was elected president of the Eastern Highlands Students' Association at the University. He also remembered those who had helped him in the past and maintained contact with them. For example, although the Tuffs had returned to the United States in 1974, Atawe often wrote them letters. They were impressed with his ability to express himself in writing and, naturally, delighted with his academic progress. They remembered, of course, when Atawe had first come to them in Wonenara in 1964. Atawe also wrote one or two letters a year to the Pinnos, who had moved to Canada. In a letter to the writers the Pinnos make some interesting comments on Atawe and Papuan New

> Atawe was a good student, certainly above average. He was certainly intelligent but whether he was 'highly intelligent' is another matter and one which would require further investigation ... In our eight years in Papua New Guinea we really did not meet students whom we would regard as scholars. There were students who had the potential to excel scholastically but they seemed to be content with doing less than they were capable of. This can be attributed in part to cultural factors. We can't recall any of our students who really exerted themselves when it came to studying.

Dr Neil Robert's comments on Atawe's diligence while at UPNG, when considered in the light of this last quotation, would suggest that Atawe learned to apply himself better while doing his university course in Port Moresby.

'Unitech' Tutor

Atawe's appointment to Lae was important to him for at least two reasons. First, it enabled him to continue with higher mathematical studies while at the same time receiving a good income and inexpensive campus accommodation. Second, it meant that he was one of a small number of National academic staff at the universities of Papua New Guinea. During his first few years at 'Unitech' Atawe will not have to deliver lectures, but he will assist in classes taken by senior members of the Mathematics Department and he will be expected to help students who have difficulty understanding material presented in lectures or problems given as tutorial exercises. Since it is government policy that contracts of expatriate university staff will not be renewed when their positions can be filled by competent and qualified National staff, it is almost certain that one day Atawe will teach mathematics, at the highest levels, in his own country.

In 1980 Atawe was one of six National students who began the Post-Graduate Diploma in Mathematics course at 'Unitech'. During the year he found himself studying topics such as ordinary and partial differential equations, multiple integrals, Fourier series, vector spaces, and probability and statistics. Despite the fact that all of the students taking the course held tutorships in Mathematics or Engineering, and several of them had studied more Mathematics than Atawe in their first degrees, no-one did better than Atawe on the tests and examinations required of the candidates. He gained between 65 and 79 on each of the four examinations for which he presented. Despite pressures arising from his role as tutor, Atawe has clearly dedicated himself to the task of doing well on the course, and both authors have observed him working for long periods of time on problem sheets set by lecturers.

While Atawe's present life-style differs sharply from that of his people in Wiyava, he says he will always regard himself, first and foremost, as a Baruya man. In October 1979, soon after he began his work at 'Unitech', he married Merumbewiye ('Meru') in a Christian ceremony at Marawaka. For about a year and a half before her marriage 'Meru', a Baruya woman who had been educated to the grade 4 level at the Marawaka Community School, received training in household management from a missionary couple stationed in Marawaka. Although 'Meru' and Atawe were happy to agree to share their lives together they did not have a period of courtship in the Western sense. Of his marriage, Atawe stated in a letter to one of the writers (Clements) in November 1980:

> We only had a Christian ceremony. The reason we couldn't have a traditional ceremony was because I couldn't build myself a house in the village; our tradition is such that a man must build himself a new house before he gets married so that he can take his wife to their new house after they are married. I had no time to build my new house because of my job at 'Unitech'. I will be building my house during the Xmas break but will not have the traditional marriage ceremony because I am already living with my wife.

Atawe and 'Meru' currently live in a house on the Unitech campus, and every now and then a Baruya man or youth calls at their home and is provided with free board. Altogether, about twenty 'boarders' have arrived; rather than feed and maintain them for indefinite periods of time Atawe prefers to pay bus and 'plane fares for their return to Wiyava. Each 'return' costs about forty kina (approximately $A50), which is almost a week's salary for Atawe.

According to Atawe, Wiyava will always be home: "I was born there; you always have to have a place to go'. He believes it is unlikely he will ever return to Wiyava to live permanently, but does not preclude the possibility of going back for extended periods of time if he feels he can help his people, perhaps as a teacher. He believes that he would have no difficulty living in Wiyava for any period of time, and that if he chose to do so he would adopt the traditional live-style of his people, completely. Interestingly, he feels his people would not like him to return to the village permanently - they believe that they made an investment in his education, and that he should apply what he has learnt in the wider world, while at the same time continuing to regard himself as a Baruya person. They are proud of Atawe.

Atawe's wife, Merumbewiye, is in a particularly unenviable position. Although she speaks 'Pidgin' well, and a little English, she is slightly embarrassed to meet English-speaking colleagues of Atawe in the Mathematics Department at 'Unitech'. Furthermore, for the first time, she is surrounded by people who not only do not speak her language, but eat different foods and have different life-styles. She has entered a community which, unlike her village community, has roads, cars, bicycles, electricity, radios, washing machines, shops, sewerage, curtains, mattresses, and all other amenities associated with a modern residential university. In addition, while her husband is dedicated to becoming one of the best mathematicians in his country, she herself did not go beyond grade 4 at school.

Atawe himself has adjusted well to his position at Unitech. He shares a room in the Mathematics Department with Dr Chris Wilkins, an expatriate lecturer from Adelaide. Atawe and Chris are good friends, Atawe took another expatriate lecturer in the Mathematics Department, Dr Robert Hyde, to Wiyava in November 1980 - earlier in 1980 he had taken four other Unitech staff (including one of the writers (Clements)) to his village. Atawe is well liked and respected throughout the Mathematics Department. When asked to reply, in writing, to the questions. 'What are your ambitions? Would you like to become professor of Mathematics at Unitech? Would you like to obtain an M.Sc. or M.Ed. from an English, Australian, or American University?, Atawe replied:

> Well, to be quite honest, professor of Mathematics is <u>not</u> one of my ambitions. I like my job at 'Unitech' with the maths department and certainly would like to work up to lecturer level. But, as you know, people's attitudes change with time and I can't say how I will think about things in ten years' time, say, from now. I have not quite made up my mind as to where I would want to do my M.Sc. or M.Ed., but I suppose I could try an Australian University.

This guarded reply reflects not only Atawe's basic modesty, but also his personal commitment to gaining professional advancement.

Reflections on Education in Papua New Guinea and Elsewhere

The preceding description of how one Papua New Guinean has been able to bridge the gap between his traditional culture and that implicitly expected of a member of staff in a European residential university raises at least two issues which are pertinent to all concerned with the problems of establishing formal educational systems in developing countries with limited resources, and would appear to have been well illustrated in the story which has been told.

The first issue concerns the interaction between language of instruction, society, and curricula. English is the language of instruction in Community Schools in Papua New Guinea, yet this language is rarely used by most Community School children outside the classroom.[12] The recent study by P. Jones[13] demonstrates that most Community School children experience great difficulty in understanding important aspects of mathematical language which are understood by most children, of about the same age, for whom English is the first language. Undoubtedly many children in Community School classrooms simply do not understand what their teachers are saying in mathematics lessons, and do not comprehend word problems which appear in pencil-and-paper tests of mathematics. The story of Atawe is one of a survivor in the educational system; for years Atawe did not understand what his teachers were saying, but he continued to try. Most children would show less tenacity in such a situation. One wonders, for example, how six-year old Australian children would react if, day after day, their teachers always spoke to them in Russian.

Of course, the fact that instruction is in English is not the only special difficulty confronting Community School children. Indeed, the whole notion of schooling is new to many communities in Papua New Guinea and, certainly, the Mathematics courses prescribed by the Department of Education contain much material which does not bear much relevance to traditional life. For example, a study by John Jones[14] not only showed that many measurement concepts associated with time, mass, length, area and capacity were rarely used in Papua New Guinea villages, but also that many measurement statements which can be expressed fairly easily in English (for example, 'To do Activity A and then immediately do Activity B would take the same time altogether as to do Activity C') can only be expressed with great difficulty, if at all, in local languages. In Wiyava, at the present time, the only standard unit of time is 'the day', and the only unit commonly used for distance is 'a day's walk'; there are no standard units for mass, area, and capacity. Also, unlike the case in Western communities, in Papua New Guinea concept classification is not normally based on hierarchical principles.[15]

The absence of standard units for measurement, and hierarchical classification systems, should not necessarily be regarded as a 'deficiency' in the local cultures however; it is arguable that these inventions of 'civilised' man are not needed in village life. However, once children from the villages go to Community Schools whose Mathematics courses are, by and large, similar to those used in developed countries, they are immediately disadvantaged in comparison with schoolchildren of the same age in the developed countries. Not only is the language of instruction incomprehensible

to them, but so too are the very concepts being taught. And, unlike many of their Western counterparts, village children do not expect to receive help with schoolwork when they get home. Usually their mothers and fathers neither speak English nor understand the mathematical concepts being presented at school. Anyway, even if parents could help they have relatively little opportunity to do so. Many children do not return to their village much before dark, for they have to walk one or two hours to and from school. The young Atawe had to to do this when attending the Wonenara school, and the same is still true today of many Community School children, especially those living in the Highlands. Once darkness falls it is difficult to do homework in most villages, for there is no electricity or other suitable source of light. Probably, the typical middle-class Western child does a thousand hours more homework, before leaving primary school, than the typical Community School child.

Despite difficulties arising because English is the language of instruction, and because Western mathematical concepts are not obviously relevant to traditional life-styles, Mathematics syllabuses prescribed for Papuan New Guinean Community Schools are at least as sophisticated as those prescribed for Australian primary schools. Even Community School teachers have difficulty understanding topics contained in the syllabuses.[17] As Clements and Lean have stated, 'the needs of mathematics education in Papua New Guinea would, perhaps, be better served by a syllabus which takes account of where pupils and teachers really are, rather than where curriculum planners think they ought to be.'[18] Although recent studies suggest that the pattern of cognitive abilities of Community School and Western children are similar,[19] it is also true that Papua New Guinean Community School children are not able to cope nearly as well as Australian children on standard pencil-and-paper tests of elementary school mathematics. In 1980, for example, Clements and Lean gave a Papua New Guinean version of the Monash Assessment of Mathematical Performance test to sixth grade classes in Community Schools in the Southern Highlands, Rabaul and Manus Islands, and found that the average score on this pencil-and-paper test was 11/36, the highest score being 22/36. By comparison, the average score for grade 5 pupils in Victoria on the test is 23/36.[20]

We would maintain that if the Papua New Guinea Department of Education persists with Community School Mathematics syllabuses which are obviously derived from Western models then, ultimately, Papua New Guinean children will perform at the same levels as Western children on comparable pencil-and-paper tests of Mathematics. But, in the view of the present writers, this will occur only after several generations, and will cost the country dearly in terms of loss of traditional culture. Pam Harris, in

her recent and provocative study of 'Measurement in Tribal Aboriginal Communities' in Australia, has made some pertinent comments on this issue.[21] She has argued, with the support of relevant data, that 'any applied number program which is written for English-speaking white Australian children living in urban situations is likely to be both inappropriate and inadequate for use with vernacular speaking Aboriginal children living in remote tribal communities', because:

(a) many of the concepts presented will be foreign to the Aboriginal child and in conflict with his traditional world view;

(b) in many instances the way of expressing the concept in the child's first language will be quite different from the way in which it is expressed in English, thus causing confusion with vocabulary and terminology;

(c) in some cases, where the concept is totally foreign to the child's culture, there will be no concise way of explaining it in the child's own language. Thus, the child will be required to learn new vocabulary and a new concept, both at the same time; and usually to do so in a second language;

(d) many of the concepts introduced will not be reinforced outside of the school because they are either not used in the Aboriginal community, or are in conflict with established custom;

(e) the concepts presented will assume prior knowledge and experiences that the Aboriginal child does not have, while ignoring the different set of knowledge and experiences that the Aboriginal child does have; and

(f) failing to take account of the Aboriginal child's different cultural environment, such a program will also fail to observe the fundamental principle that teaching must always begin with that which is known and proceed from the known to the unknown.[22]

The above comments, suitably modified, could be equally applied to Mathematics courses studied by Wiyava children attending the Community School in Wonenara and indeed, the village children attending the majority of Community Schools in Papua New Guinea.

Undoubtedly there will continue to be a few 'Atawes', who progress through the early grades of the Community Schools understanding very little of what is being taught, but subsequently proceed to tertiary studies and to positions which will enable them to assist their country's rapid technological development. In Papua New Guinea there are houses, hospitals, roads, dams, and hydro-electricity stations to be built, diseases to be diagnosed and cured, children to be educated, and it is the educational survivors, the 'Atawes', who will be given more and more responsibility in the organization and execution of the large programs which will be needed. The school

system will enable the gifted few to be identified. But, meanwhile, what will the education system do for the vast majority which does not proceed beyond grade 6?

A second issue raised by Atawe's story has relevance both within and beyond Papua New Guinea. The Papua New Guinea government's policy of encouraging National appointments to responsible positions meant that Atawe is now a university mathematics tutor despite the likelihood that his present mathematical knowledge and skills are considerably below those of, say, a masters or Ph.D. graduate in Mathematics from a reputable Western university. Yet we would maintain that Atawe's achievement in reaching his present level of Mathematics surpasses that of the typical middle-class student who gains a higher degree in Mathematics at a Western university. Perhaps educational administrators throughout the world should take more account of societal variables which contribute to a person's 'performance', and perhaps 'achievement' and 'potential' should also be considered in the light of these variables. If this were to happen then, for example, there would be a much wider range of social backgrounds among medical students in Western universities. Even the use of so-called culture-fair intelligence tests would not provide a ready answer to the problem being raised here, for it can be argued strongly that no test can ever be culture-fair. In this context it will be recalled that towards the end of his secondary schooling Atawe scored three standard deviations below the mean on a standardized test of reasoning which was administered by the government's Psychological Services Department. On the basis of this result one would have been excused for thinking that, clearly, Atawe was not university material.

We conclude this essay with the observation that many problems inevitably associated with the development of formal educational systems in technologically developing countries become more clearly defined in the light of biographical sketches such as the one given in this essay. The anxieties, bewilderment and excitement of the young Atawe attending the Wonenara Mission School in the mid-1960s could never be captured in the morass of numerical data typically found in reports of educational administrators and evaluators. Yet it is our belief that everyone working in formal educational systems, and especially educational leaders in developing countries, should be more concerned with the effects which an educational system has on individuals and traditional societies than with the contribution the system makes to a country's technological advancement.

References

[1]Note that in 1975 the territories of Papua and New Guinea combined to become the independent nation of Papua New Guinea.

[2]M. Godelier, Perspectives in Marxist Anthropology (C.U.P., 1977), p. 11.

[3]Ibid., p. 201.

[4]See Godelier, op.cit., p.204-220. See also K.A. McElhanon (Ed.), Legends from Papua New Guinea (Ukarumpa (P.N.G.), Summer Institute of Linguistics, 1976), pp.54-68.

[5]J. Timson, 'Lazzaro Spallanzani's Seminal Discovery', New Scientist, 13 December 1979, p.886.

[6]M.A. Clements & G.A. Lean, 'Influences on Mathematical Learning in Papua New Guinea: Some Cross-cultural Perspectives', P.N.G. University of Technology Mathematics Education Centre, Report No.13, 1980.

[7]Godelier, op.cit., p.151.

[8]Throughout the Papua New Guinea Highlands the Baruyas' prowess with the bow and arrow is legendary.

[9]'National' is a term used throughout Papua New Guinea to describe a native of the country.

[10]For a discussion of this point, and relevant data, see Clements and Lean, op.cit., pp.46-52.

[11]Note that in 1975 Goroka Teachers' College became affiliated with the University of Papua New Guinea.

[12]Clements and Lean, op.cit., pp.46-52.

[13]P. Jones, 'Mathematical Language and the Learning of Mathematics in P.N.G.', P.N.G. University of Technology Mathematics Education Centre, Report No.16, 1981.

[14]J. Jones, 'Quantitative Concepts, Vernaculars, and Education in Papua New Guinea', University of Papua New Guinea Educational Research Unit, Research Report No. 12, 1974.

[15]D.F. Lancy, 'Indigenous Mathematics Systems', Papua New Guinea Journal of Education, vol. 14, 1978, pp.5-15.

[16]Clements & Lean, op. cit., p.48.

[17]R.E. Roberts & V. Kada, 'The Primary Mathematics Classroom', Papua New Guinea Journal of Education, vol. 15, 1979, pp.174-201.

[18]Clements & Lean, op.cit., p.52.

[19]See, D.F. Lancy, 'Cognitive Testing in the Indigenous Mathematics Project', Papua New Guinea Journal of Education, vol.14, 1978, pp.114-42; and Clements & Lean, op.cit., pp.49-50.

[20]Clements and Lean, op.cit., p.51.

[21]P. Harris, Measurement in Tribal Aboriginal Communities (Darwin, Northern Territory Department of Education, 1980).

[22]Ibid., p.75.

INDIGENOUS MATHEMATICS PROJECT

WORKING PAPER SERIES

1. Learning to Compute.
   R. Souviney, January 1980.

2. Strategies for Mathematical Problem Solving.
   R. Souviney, March 1980.

3. Assessment Administration Guide.
   R. Souviney, April 1980.

4. Field Guide for Studying Classroom Events and Their Cultural Context.
   P. Levin, M. Gearhart and R. Souviney, June 1980.

5. International Congress on Mathematics Education.
   R. Souviney, V. Kada and D. Malaga; D. Lancy; M. Britt; B. Roberts, August 1980.

6. Andra Community School Field Report.
   P. Levin, November 1980.

7. Ororo Community School Field Report.
   J. Lineberger, November 1980.

8. Divanap Community School Field Report.
   M. Gearhart, November 1980.

9. Kero Community School Field Report.
   K. Johnson, November 1980.

10. Muglamp Community School Field Report.
    B. Rowe, November 1980.

11. Teachers Notes and Student Worksheets – Grade 2. 1980.

12. Teachers Notes and Student Worksheets – Grade 4. 1980.

13. Teachers and Students Text – Grade 6. 1980.

14. The Changing Form of Numerical Reasoning Among the Oksapmin.
    G. Saxe, January 1981.

15. Intra-Cultural Variation in Cognitive Development – Conservation of Length Among the Imbonggu.
    D. Lancy, R. Souviney, V. Kada, February 1981.

16. The Education of Atawe.
    M. Clements and P. Jones, March 1981.

17. Influences on Mathematical Learning in Papua New Guinea – Some Crosscultural Perspectives.
    M. Clements and G. Lean, May 1981.

18. Teaching Community School Mathematics – A Comparison of Five Sites.
    B. Miller-Souviney, June 1981.

19. Classroom Maths Games.
    IMP Staff, June 1981.

20. Teaching and Learning Mathematics in the Community Schools of Papua New Guinea.
    R. Souviney, July 1981.